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10/720,498	11/24/2003	James A. Hunter	10021.003020 (P0043)	4571
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OKAMOTO & BENEDICTO, LLP			TSAI, H JEY	
P.O. BOX 641330			ART UNIT	PAPER NUMBER
SAN JOSE, CA 95164			2812	

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Please find below and/or attached an Office communication concerning this application or proceeding.

A

<b>Office Action Summary</b>	<b>Application No.</b> 10/720,498	<b>Applicant(s)</b> HUNTER ET AL.	
	<b>Examiner</b> H.Jey Tsai	<b>Art Unit</b> 2812	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 11 August 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,3,5-12 and 14-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,5-12 and 14-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***Claim Rejections - 35 USC § 112***

Claims 9-12, 14-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 9, the demarcation of " high temperature" and 'low temperature has not been specified. Scope of the claimed invention should be affirmatively recited.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 6, 7, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Franke et al. 6,448,622 in view of Fiorini et al. 6,884,636, newly cited.

Franke et al. teaches a method of fabricating an integrated device, the method comprising:

forming a plurality of transistors of an integrated device having gate, source/drain, fig. 1, 15, col. 4, lines 26-67, col. 9, line 38-67,

forming a protective layer 225 over the plurality of transistors after the plurality of transistors is formed, fig. 1 and 15,

Art Unit: 2812

forming a capacitive micromachined transducer (a resonator 1510 or a movable element 505) over the protective layer, the transducer including a membrane that is formed using a high temperature process (at about 650 for poly-SiGe, col. 5, lines 14-16 or poly-si at 900 C, col. 4, table 1, claim 9), the plurality of transistors and the transducer being formed on a same substrate,

forming an interconnect line electrically coupling the transducer and a transistor in the plurality of transistors, fig. 15 or 7-13,

claim 6, using LPCVD process, col. 3, lines 15-40,

claim 7, suspending the movable element over a bottom electrode, fig. 15 or 13,

claim 8, using a doped polysilicon layer 310 as a bottom electrode, fig. 7.

The difference between the references applied above and the instant claim(s) is: Franke et al. teaches forming a movable element for a capacitor transducer (a movable element or resonator) to generate frequency response by using a poly-SiGe layer formed at about 650 degree C but does not teach the specific poly-SiGe depositing temperature at about 700 degree C. However, Fiorini et al. teaches at col. 8, lines 35-40, forming a poly-SiGe layer at about 700 degree C.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by poly-SiGe layer at about 700 degree C as taught by Fiorini et al. because poly-SiGe layer depositing temperature can be formed at a higher temperature to obtain the similar film characteristics.

Claims 9-10 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Franke et al. 6,448,622 in view of Dreschel et al. 6,773,401, previously applied.

Franke et al. teaches a method of fabricating an integrated device, the method comprising:

forming a plurality of transistors of an integrated device having gate, source/drain, fig. 1, 15, col. 4, lines 26-67, col. 9, line 38-67,

forming a protective layer 225 over the plurality of transistors after the plurality of transistors is formed, fig. 1 and 15,

forming a capacitive micromachined transducer (a resonator 1510 or a movable element 505) over the protective layer, the transducer including a membrane that is formed using a high temperature process (at about 650 for poly-SiGe, col. 5, lines 14-16 or poly-si at 900 C, col. 4, table 1, claim 9), the plurality of transistors and the transducer being formed on a same substrate,

forming an interconnect line electrically coupling the transducer and a transistor in the plurality of transistors, fig. 15 or 7-13,

claims 12, 15-16, using LPCVD process at low temperature, col. 3, lines 15-40,

claim 10, suspending the movable element over a bottom electrode, fig. 15 or 13,

The difference between the references applied above and the instant claim(s) is: Franke et al. teaches forming a movable element for a capacitor transducer (a movable element or resonator) to generate frequency response but does not teach the specific frequency at ultrasonic range. However, Dreschel et al. teaches at abstract, col. 10,

Art Unit: 2812

lines 35-67, forming an ultrasonic system with a movable element to generate ultrasonic frequency.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by using applying the specific voltage to the movable element or resonator so that the frequency would be in the ultrasonic range as taught by Dreschel et al. because frequency response of a movable element is corresponding to applied voltage.

Claims 3, 5 are rejected under 35 U.S.C 103 as being unpatentable over Franke et al. in view of Fionini et al. as applied to claims 1, 6, 7, 8 above, and further in view of Dreschei et al. 6,773,401, previously cited.

The difference between the references applied above and the instant claim(s) is: Franke et al. teaches forming a movable element for a capacitor transducer (a movable element or resonator) to generate frequency response but does not teach the specific frequency at ultrasonic range. However, Dreschel et al. teaches at abstract, col. 10, lines 35-67, forming an ultrasonic system with a movable element to generate ultrasonic frequency.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by using applying the specific voltage to the movable element or resonator so that the frequency would be in the ultrasonic range as taught by Dreschel et al. because frequency response of a movable element is corresponding to applied voltage.

Claims 11-12 are rejected under 35 U.S.C 103 as being unpatentable over Franke et al. in view of Dreschei as applied to claims 9-10 and 14-16 above, and further in view of Fiorini et al. 6,884,636, newly cited.

The difference between the references applied above and the instant claim(s) is: Franke et al. teaches forming a movable element for a capacitor transducer (a movable element or resonator) to generate frequency response by using a poly-SiGe layer formed at about 650 degree C but does not teach the specific poly-SiGe depositing temperature at about 700 degree C. However, Fiorini et al. teaches at col. 8, lines 35-40, forming a poly-SiGe layer at about 700 degree C.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by poly-SiGe layer at about 700 degree C as taught by Fiorini et al. because poly-SiGe layer depositing temperature can be formed at a higher temperature to obtain the similar film characteristics.

Claims 1, 6, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over De Samber et al. 5,814,554, newly cited, in view of Hoshino 4,571,661, previously cited.

DeSamber et al. teaches a method of fabricating an integrated device, the method comprising:

forming a transistor of an integrated device 10/14, fig. 2, col. 3, lines 25-67,

Art Unit: 2812

forming a first protective layer (a silicon oxide, CVD) over gate electrode 10, figs. 2-3,

forming a micro-electro-mechanical system (MEMS, including bottom electrode layer 6/9) structure over the first protective layer (a silicon oxide over the gate electrode 10), the MEMS structure including a movable element 25 (silicon nitride), col. 4, lines 10-20,

wherein the movable element 25/7 comprises a membrane of a capacitive micromachined ultrasonic transducer (CMUT), col. 2, 40-55,

claim 7, suspending the movable element 20 over a bottom electrode 6/9, interconnection line 9 by sputtering and low temperature process, fig. 2, col. 3, lines 55-67,

etching layer 21 to form capacitive sensor, fig. 3.

Hosino discloses a method of fabricating an integrated device, the method comprising:

forming a transistor of an integrated device 26/26, fig. 2A,

forming a first protective layer 22 over the transistor,

forming a micro-electro-mechanical system (MEMS) structure over the first protective layer 22, the MEMS structure including a movable element 20 (silicon nitride) that is formed using a deposition process at a temperature of at least about 700 C, col. 4, lines 33-47,

wherein the movable element 20 comprises a membrane of a capacitive micromachined ultrasonic transducer (CMUT), col. 2, 40-55,



Art Unit: 2812

wherein the integrated device comprises a wherein the deposition process comprises low-pressure chemical vapor deposition (LPCVD), col. 4, 33-47, suspending the movable element 20 over a bottom electrode 24, interconnection line 42, 44 by sputtering and low temperature process, fig. 3 col. 3, lines 33-55, etching layer 20 to form capacitive sensor, fig. 3.

Note: patentable weight is not given to the intended use of capacitive sensor in ultrasonic application. The claimed using capacitive movable element sensor for ultrasonic application differs from prior art second capacitor plate only its claimed intended use (for electrically floating ). However, the manner or method of use of a machine isn't germane to the patentability of the machine and process of making itself. A statement of intended use does not distinguish the process of making and structural apparatus claimed over the prior art ref. Ex parte Cullis, 11 USPQ2d 1876 (BPPAI)

The difference between the references applied above and the instant claim(s) is: De Samber et al. teaches forming a silicon nitride movable element for a capacitor transducer (a movable element or resonator) but does not teach forming silicon nitride layer at about 700 degree C. However, Hoshino teaches at col. 4, lines 33-47, forming a movable silicon nitride layer at about 700 degree C.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by forming a silicon

Art Unit: 2812

nitride layer at about 700 degree C as taught by Hosino because silicon nitride layer is known to formed at about 700 degree C.

Claims 3, 5, 8 are rejected under 35 U.S.C 103 as being unpatentable over De Samber et al. in view of Hosino as applied to claims 1, 6, 7 above, and further in view of Dreschei and Franke et al. 6,448,622, previously cited.

The difference between the references applied above and the instant claim(s) is: De Samber et al. teaches forming a movable element for a capacitor transducer (a movable element or resonator) to generate frequency response but does not teach the specific frequency at ultrasonic range. However, Dreschel et al. teaches at abstract, col. 10, lines 35-67, forming an ultrasonic system with a movable element to generate ultrasonic frequency. And, Franke teaches at fig. 7, using a doped polysilicon layer 310 as a bottom electrode.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by using applying the specific voltage to the movable element or resonator so that the frequency would be in the ultrasonic range as taught by Dreschel et al. because frequency response of a movable element is corresponding to applied voltage. And, It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by using a doped polysilicon layer as bottom electrode as taught by Franke et al. because doped polysilicon layer is a conductor.

Claims 9-12, 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over De Samber et al. 5,814,554, newly cited, in view Dreschel et al. 6,773,401 and Hosino 4,571,661, previously cited.

De Samber et al. teaches a method of fabricating an integrated device, the method comprising:

forming a transistor of an integrated device 10/14, fig. 2, col. 3, lines 25-67,  
forming a first protective layer (a silicon oxide, CVD) over gate electrode 10, figs. 2-3,

forming a micro-electro-mechanical system (MEMS, including bottom electrode layer 6/9) structure over the first protective layer (a silicon oxide over the gate electrode 10), the MEMS structure including a movable element 25 (silicon nitride), col. 4, lines 10-20,

wherein the movable element 25/7 comprises a membrane of a capacitive micromachined ultrasonic transducer (CMUT), col. 2, 40-55,

suspending the movable element 20 over a bottom electrode 6/9,  
interconnection line 9 by sputtering and low temperature process, fig. 2, col. 3, lines 55-67,

etching layer 21 to form capacitive sensor, fig. 3.

Note: patentable weight is not given to the intended use of capacitive sensor in ultrasonic application. The claimed using capacitive movable element sensor for

Art Unit: 2812

ultrasonic application differs from prior art second capacitor plate only its claimed intended use (for electrically floating ). However, the manner or method of use of a machine isn't germane to the patentability of the machine and process of making itself. A statement of intended use does not distinguish the process of making and structural apparatus claimed over the prior art ref. Ex parte Cullis, 11 USPQ2d 1876 (BPPAI)

The difference between the references applied above and the instant claim(s) is: De Samber et al. teaches forming a silicon nitride movable element for a capacitor transducer (a movable element or resonator) but does not teach does not teach the specific frequency at ultrasonic range. However, Dreschel et al. teaches at abstract, col. 10, lines 35-67, forming an ultrasonic system with a movable element to generate ultrasonic frequency. And, Hosino teaches at col. 4, lines 33-47, forming a movable silicon nitride layer at about 700 degree C.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by using applying the specific voltage to the movable element or resonator so that the frequency would be in the ultrasonic range as taught by Dreschel et al. because frequency response of a movable element is corresponding to applied voltage. And, It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by forming a silicon nitride layer at high temperature of about 700 degree C as taught by Hosino because silicon nitride layer is known to formed at about 700 degree C.

Claims 1, 9-12 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoshino 4,571,661, previously applied. In view of Franke et al. 6,448,622, previously applied.

Hosino discloses a method of fabricating an integrated device, the method comprising:

forming a transistor of an integrated device 26/26, fig. 2A,

forming a first protective layer 22 over the transistor,

forming a micro-electro-mechanical system (MEMS) structure over the first protective layer 22, the MEMS structure including a movable element 20 (silicon nitride) that is formed using a deposition process at a temperature of at least about 700 C (claim 11), col. 4, lines 33-47,

wherein the movable element 20 comprises a membrane of a capacitive micromachined ultrasonic transducer (CMUT), col. 2, 40-55,

claim 12, wherein the integrated device comprises a wherein the deposition process comprises low-pressure chemical vapor deposition (LPCVD), col. 4, 33-47,

claim 10, suspending the movable element 20 over a bottom electrode 24,

claim 15, 16, interconnection line 42, 44 by sputtering and low temperature process, fig. 3 col. 3, lines 33-55,

claim 14, etching layer 20 to form capacitive sensor, fig. 3.

Note: patentable weight is not given to the intended use of capacitive sensor in ultrasonic application. The claimed using capacitive movable element sensor for ultrasonic application differs from prior art second capacitor plate only its claimed intended use (for electrically floating ). However, the manner or method of use of a machine isn't germane to the patentability of the machine and process of making itself. A statement of intended use does not distinguish the process of making and structural apparatus claimed over the prior art ref. Ex parte Cullis, 11 USPQ2d 1876 (BPPAI)

The difference between the references applied above and the instant claim(s) is: Hosino et al. teaches forming a movable element for a capacitor transducer (a movable element or resonator) but does not teach forming protective layer over the transistor. However, Franke et al. teaches at fig. 13 and 15, forming a protective layer 225 over the transistor.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by forming a protective layer over the transistor as taught by Franke et al. because the MEMS device can be indirectly connected to the transistor through opening in the protective layer.

Claims 3, 5, 8 are rejected under 35 U.S.C 103 as being unpatentable over Hoshino 4,571,661, in view of Franke et al. as applied to claims 1, 9-12, 14-16 above, and further in view of Dreschei et al., previously cited.

The difference between the references applied above and the instant claim(s) is: Hasino teaches forming a movable element for a capacitor transducer (a movable

element or resonator) to generate frequency response but does not teach the specific frequency at ultrasonic range. However, Dreschel et al. teaches at abstract, col. 10, lines 35-67, forming a ultrasonic system with a movable element to generate ultrasonic frequency.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the above references' teachings by using applying the specific voltage to the movable element or resonator so that the frequency would be in the ultrasonic range as taught by Dreschel et al. because frequency response of a movable element is corresponding to applied voltage.

### ***Conclusions***

Applicant's arguments filed Feb. 13, 2006 have been fully considered but they are not persuasive. Because Franke et al. teaches at background of invention that using higher temperature poly-Si layer may cause some disadvantage to the MEMS process, hence, claimed invention of at least about 700 degree C is found to be met by Franke et al.' teaching which expressly taught the same process at 650°C because the reference recognized the possibility of using temperatures greater than 750°C. see MPEP §2144.01. And, Fiorini et al. teaches at col. 8, lines 35-40, forming a poly-SiGe layer at about 700 degree C is known in the art. And, Franke et al. and Fiorini et al. clearly teaches forming membrane at high temperature of about 650 degree C and 700 degree C that meets the high temperature as claimed in claim 12. Newly cited references De

Art Unit: 2812

Samber et al. clearly teaches forming a protective layer over the transistors as set forth above.

Any inquiry of a general nature or clerical matters or relating to the status of this application or proceeding should be directed to the customer service whose telephone number is (703) 308-4357.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to H. Jey Tsai whose telephone number is (571) 272-1684. The examiner can normally be reached on from 7:00 Am to 4:00 Pm., Monday thru Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on (571) 272-1873.

The fax phone number for this Group is 571-273-8300.

hjt

10/8/2006



H. Jey Tsai  
Primary Examiner  
Patent Examining Group 2800